A K_A-BAND CHIRPED-PULSE FOURIER TRANSFORM MICROWAVE SPECTROMETER.

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The design and performance of a new chirped-pulse Fourier transform microwave (CP-FTMW) spectrometer operating from 25-40 GHz will be discussed. A 10.5-3 GHz linear frequency sweep, generated by a 24 GS/s arbitrary waveform generator, is upconverted by a 23.00 GHz phase-locked oscillator, then fed into an active doubler to create a 25-40 GHz chirped pulse. After amplification with a 60-80 W pulsed traveling wave tube amplifier, the pulse is broadcast across a molecular beam chamber where it interacts with a molecular sample. The molecular FID signal is downconverted with the 23 GHz oscillator so that it can be digitized on a 50 GS/s oscilloscope with 16 GHz hardware bandwidth. The sensitivity and phase stability of this spectrometer is comparable to that of the previously reported 6.5-18.5 CP-FTMW spectrometer.[a] On propyne ($\mu = 0.78$ D), a single-shot signal to noise ratio of approximately 200:1 is observed on the $J = 2 - 1$ rotational transition at 34183 MHz when the full bandwidth is swept; optimal excitation is observed for this transition with a 250 MHz bandwidth sweep. The emission has a T_2 lifetime of 4 μs. Early results from this spectrometer, particularly in the study of species of astrochemical interest, will be presented.

[a]G.G. Brown *et al.*, *Rev. Sci. Instrum.* **79** (2008) 053103.